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S X P Cotton In Comparison With Pima

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INTRODUCTION

The purpose of this circular is to set forth the characteristics of the S × P variety of American-Egyptian cotton, in comparison with those of the older Pima variety. Particular consideration will be given to the comparative yields of the two varieties and to the factors involved in productiveness, as these are the features of greatest interest to cotton growers.

Such information as is available indicates that the fiber of S × P, although appreciably shorter than that of Pima, is long enough and of good enough character to meet the requirements of many manufacturers who utilize extra long-staple cotton of Egyptian type. During the period in which S × P has been produced commercially, 1934–38, growers have sold the lint on a parity with Pima, or at prices differing, one way or the other, by not more than 1 cent per pound.

Commercial production of American-Egyptian cotton is at present limited to the irrigated valleys of southern Arizona.[2] Expansion of the acreage may result from the relative freedom of this type of cotton

[1] Acknowledgments are made to the following for assistance in obtaining data and information: To officials of the Arizona Agricultural Extension Service of the College of Agriculture of the University of Arizona and of the Bureau of Plant Industry field stations at Shafter and Bard, Calif., and at State College, N. Mex.; also to the Maricopa County Farm Bureau Pure Seed Association, of Arizona, to the Arizona Crop Improvement Association, to the cooperative growers of American-Egyptian cotton, particularly W. K. Shaw, Jr., K. B. McMicken, of the Southwest Cotton Co., Walter L. Smith, Jesse Williams, Cottrell & Saylor, and J. G. Boswell & Co., and to the cooperative ginners Miller & Jennings.

[2] This statement applies only to domestic production. Maarad, an Egyptian variety derived from and similar to Pima, is grown in Egypt, approximately 84,000 acres having been planted with that variety in 1937. The Soviet Union is reported to have let contracts, in 1937, for a total of 188,523 acres planted chiefly with either Maarad or Pima.[3] About 24,000 bales of Pima were produced in Peru in 1936.

[3] Michael, Louis G. cotton growing in the soviet union. U. S. Bur. Agr. Econ. Foreign Agr. 2: [353]–382, illus. 1938. [Processed.] See p. 378.

from the acreage restriction to which shorter staple cottons are now subject. One of the greatest hindrances to the prosperity of the industry has been the violent fluctuation in the annual production, the acreage planted each year having reflected rather closely the prices received during the preceding marketing season. Consequently, consumers are always in doubt as to how much American-Egyptian cotton is likely to be available, and many mills that might otherwise use this cotton regularly prefer imported Egyptian cottons, of which a large supply is always at hand. It would be greatly to the advantage of growers of this kind of cotton if the annual production could be stabilized in a quantity sufficient to supply the normal requirements of the mills.

HISTORY OF THE S × P VARIETY

Plants of the Sakel (Sakellaridis) variety, grown at the United States Field Station, Sacaton, Ariz., from seeds imported from Egypt, were crossed with plants of the Pima variety in 1918. The S × P variety was developed from one of these crosses by annual selection of the best individual plants.

Seed of the twelfth inbred generation, which appeared to be as constant and uniform as Pima, was used for a test planting of 200 acres made by W. K. Shaw, Jr., near Chandler, Ariz., in 1933. The results of this test encouraged Mr. Shaw to plant 600 acres the following year. After 1934, numerous farmers began to grow the new variety. The area planted increased to about 1,700 acres in 1935 and to about 9,000 acres in 1936. In 1937, the 6,909 acres of S × P amounted to 36 percent of the total acreage of Egyptian-type cotton in Arizona. The acreage of S × P grown in 1938 has not been determined definitely, but it is believed that about 20,000 acres, approximately half of the total acreage of American-Egyptian cotton, were of this variety.[4]

CHARACTERS BY WHICH VARIETIES MAY BE DISTINGUISHED IN THE FIELD

At present, both Pima and S × P are grown commercially in Arizona, in the Salt River Valley, Maricopa County, and in the Coolidge-Casa Grande irrigation district, Pinal County. Consequently there is danger of contamination of the planting seed of both varieties. It is important, therefore, to know how to recognize plants of either variety, in order to determine whether mixture has occurred in fields under consideration as a source of planting seed.

S × P cannot be distinguished readily from Pima until the bolls are formed. The plants of S × P tend to develop more limbs, but mostly in late season, and the leaves are more cupped and almost imperceptibly more grayish in color. The characters of the bolls (fig. 1) make identification certain, as they have longer, harder points and a dull, more conspicuously pitted surface. The seeds of S × P are less fuzzy than Pima seeds, and the fuzz tends to be more aggregated at the ends of the seed and not quite so green in color (fig. 2).

[4] The commercial introduction of the S × P variety is discussed fully in the following publication: KING, C. J., BECKETT, R. E., and PARKER, ORLAN. AGRICULTURAL INVESTIGATIONS AT THE UNITED STATES FIELD STATION, SACATON, ARIZ., 1931–35. U. S. Dept. Agr. Cir. 479, 64 pp., illus. 1938.

The lint is not easily distinguished in the field on the basis of length, but the lighter color of the S × P lint usually is pronounced in newly opened bolls.

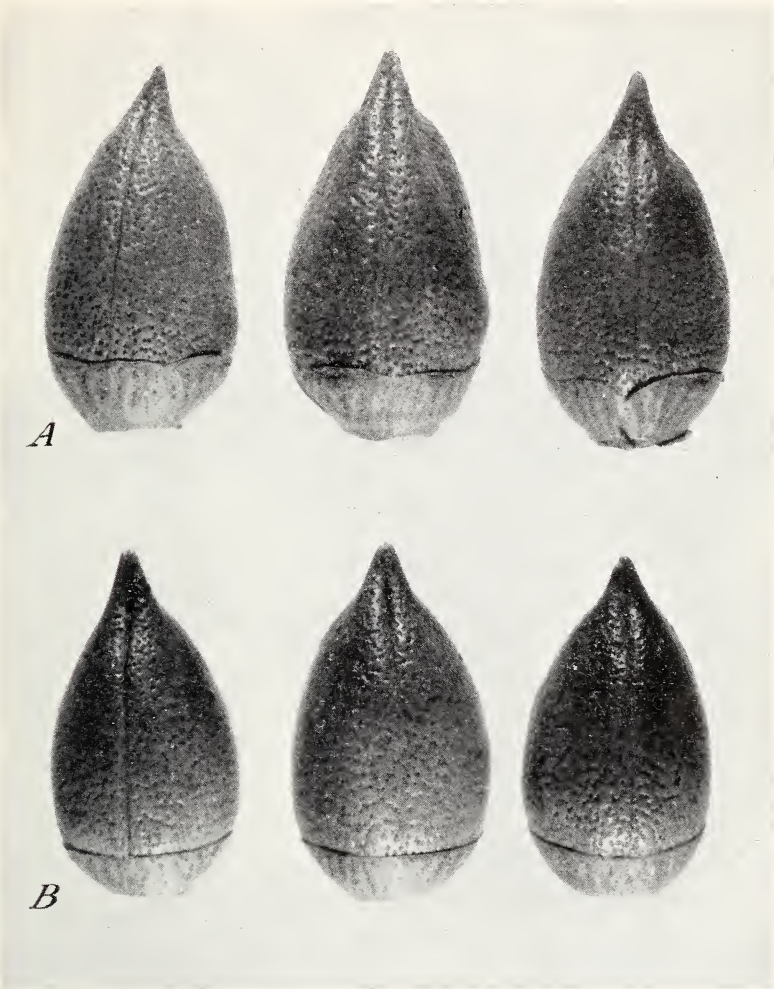

FIGURE 1.—S × P bolls (*A*) are longer pointed, less shiny, and more conspicuously pitted than Pima bolls (*B*). The differences are less pronounced in the late-maturing bolls represented in this photograph than in earlier-maturing bolls.

YIELD

During the period 1927 to 1937, S × P and Pima were grown side by side in 22 tests designed to compare yields. The results of the comparisons are presented in table 1. The localities of all the tests are in Arizona, except those conducted at Bard and Shafter, Calif., and State College, N. Mex. In all tests the 2 varieties were grown in alternate rows or in alternate blocks of 2 or more rows each. The number of

directly comparable units ranged from 3 to 50 pairs. Although the differences shown in some of the individual tests are probably not statistically significant, it is believed that the results of the whole series present a fair comparison of S × P and Pima under conditions

FIGURE 2.—Seeds of S × P (*A*) are not so fuzzy as Pima seeds (*B*).

prevailing in sections of the southwestern United States suited to the culture of Egyptian-type cotton.

Sufficient data are not available in every instance to compute the yield per acre. For this reason, the differences in yield of seed cotton and lint are shown in the last two columns of table 1 as percentages of the Pima yield. A plus sign (+) indicates a difference in favor of

TABLE 1.—*Comparative yields of S × P and Pima in test plots*

Year	Location of plot	Unit of comparison	Paired units	Weight of seed cotton per unit		Weight of lint per unit		Lint percentage			Difference (S×P minus Pima) as percentage of Pima yield	
				S × P	Pima	S × P	Pima	S × P	Pima	Difference (S × P minus Pima) [1]	Seed cotton [1]	Lint [1]
			Number	*Pounds*	*Pounds*	*Pounds*	*Pounds*					
1927	Mesa	1 border	3	371.0	450.0	94	105.0	25.3	23.3	+2.0	−18	−10
1927	Marinette	1,320-foot row	5	170.0	140.0	43.0	32.6	25.3	23.3	+2.0	+22	+33
1931	Sacaton	120-foot row	5	25.6	22.4	7.1	5.9	27.8	26.4	+1.4	+14	+20
1932	do	do	5	27.6	21.7	7.3	5.1	26.4	23.5	+2.9	+27	+43
1932	Shafter	4 100-foot rows	30	71.5	62.4	22.4	18.8	31.4	30.1	+1.3	+15	+19
1933	Sacaton	120-foot row	5	17.9	21.2	4.9	5.5	27.3	25.7	+1.6	−15	−10
1933	Bard	4 90-foot rows	6	36.8	33.4	11.6	8.8	31.2	26.3	+4.9	+10	+32
1933	do	do	9	47.1	42.2	13.7	11.4	29.2	27.0	+2.2	+11	+20
1933	Shafter	4 100-foot rows	9	64.3	58.4	19.0	16.5	29.4	28.3	+1.1	+10	+15
1934	Sacaton	120-foot row	5	27.5	26.1	7.5	6.6	27.1	25.2	+1.9	+5	+14
1935	do	do	6	16.7	15.9	4.9	4.2	29.1	26.3	+2.8	+5	+16
1935	Glendale	0.75-acre plot	16	917.0	743.0	264.0	184.0	28.8	24.4	+4.4	+23	+13
1935	Coolidge	4 270-foot rows	6	92.0	94.0	28.2	27.5	30.7	29.3	+1.4	−2	+2
1935	Perryville	4 300-foot rows	5	35.3	49.2	10.1	13.3	28.5	27.1	+1.4	−28	−24
1935	State College	70-foot row	11	3.2	2.4	1.0	.7	32.0	31.6	+.4	+33	+35
1936	Sacaton	20-foot row	36	10.9	11.3	3.2	3.0	29.0	26.7	+2.3	−3	+7
1936	do	100-foot row	50	9.0	10.1	2.5	2.7	27.5	27.0	+.5	−11	−7
1936	Shafter	200-foot row	12	32.9	29.2	10.1	8.3	30.7	28.6	+2.1	+13	+22
1936	do	300-foot row	18	45.3	44.0	13.9	12.6	30.7	28.6	+2.1	+3	+10
1937	Sacaton	100-foot row	50	10.5	12.6	2.9	3.3	27.8	26.3	+1.5	−17	−12
1937	Shafter	300-foot row	18	51.1	49.5	16.6	15.4	32.5	31.1	+1.4	+3	+8
1937	State College	35-foot row	24	5.1	4.5	1.8	1.5	35.2	33.4	+1.8	+13	+20
Mean difference										percent +1.97	+5.1	+13.3
Standard error of mean difference										.222	3.27	3.83
Mean difference ÷ standard error										8.87	1.56	3.48

[1] A plus sign indicates a difference in favor of S × P, whereas a minus sign shows that Pima excelled in yield or lint percentage.

S × P, whereas a minus sign (−) shows that Pima excelled in yield; this plan is also followed in other tables. The averages for all of the tests, given at the bottom of table 1, show that S × P exceeded Pima by 5.1 percent in production of seed cotton and 13.3 percent in yield of lint.

In two large-scale comparisons, in which entire fields were treated as units, S × P surpassed Pima in lint yield by 11.4 percent in 1935 and by 18.5 percent in 1937. These comparisons are discussed further under the next heading.

GIN OUTTURN OR LINT PERCENTAGE

The outstanding difference between the two varieties, from the standpoint of yield and financial return, is the consistently higher lint percentage of S × P. In outturn at the gin that variety has exceeded Pima in every comparison (tables 1 and 2).

TABLE 2.—*Differences between S × P and Pima, as determined by analyses of samples obtained from test plots* [1]

Year	Location of plot	Bolls per sample	Samples	Difference (S × P−Pima)							
				Weight of seed cotton per boll	Weight of lint per boll	Lint percentage	Lint index	Lint length	Seeds per boll	Seed index [2]	Seed fuzziness grade
		Number	*Number*	*Gram*	*Gram*			*Inch*	*Number*		
1926	Sacaton	10	37	+0.1	+0.08	+1.6	+0.5	−0.09	−0.1	+0.2	−1.5
1926	do	5	50	+.3	+.16	+2.4	+.7	−.06	+.7	+.3	−1.1
1927	do	10	30	+.3	+.14	+1.6	+.5	−.10	+.8	+.3	−1.0
1928	do	10	20	.0	+.09	+2.2	+.6	−.12	−.3	−.2	−1.9
1929	do	10	23	.0	+.05	+1.0	+.4	−.12	−.2	−.1	−1.3
1930	do	10	12	+.3	+.14	+1.7	+.6	−.07	+.3	+.6	−1.6
1931	do	10	12	+.6	+.22	+1.7	+.5	−.06	+1.8	+.7	−1.8
1932	do	10	24	+.3	+.18	+2.6	+.6	−.06	+1.3	−.3	−1.9
1932	do	1	100	+.1	+.06	+.9	+.4	−.17	−.3	+.4	
1933	do	10	24	+.2	+.09	+1.4	+.4	−.07	+.5	+.3	−1.9
1933	do	1	100	+.2	+.11	+1.5	+.4	−.10	+.8	−.1	
1933	Bard	10	6	+.5	+.27	+5.3	+1.3	−.06			
1933	do	10	9	.0	+.06	+2.2	+.6	−.06			
1934	Sacaton	10	24			+.9	+.4	−.09			−2.2
1934	do	1	100	+.4	+.13	+3.8	+.5	−.12	+.9	+.9	−3.2
1935	do	10	25			+1.4	+.4	−.07			−2.3
1935	do	1	25	.0	+.05	+2.0	+.4	−.10	−.4	.0	−2.8
1935	Coolidge	10	18	+.3	+.13	+1.4	+.5	−.08			
1935	Perryville	10	15	+.2	+.08	+1.5	+.3	−.07			
1935	Scottsdale	10	8	−.1	+.04	+2.0	+.5	−.10			
1936	Sacaton	10	25	−.2	−.04	+.8	+.1	−.03			−2.3
1936	do	50	4	.0	+.05	+1.1	+.5	−.12	−.7	+.3	−2.7
1936	do	100	5	+.1	+.04	+.5	+.2		−.2	+.5	−1.6
1936	do	10	10	+.1	+.07	+.8	+.4		−.1	+.3	
1937	do	10	22	−.1	+.06	+3.0	+.7	−.08			−2.8
1937	do	50	3	+.2	+.11	+1.9	+.6		−.2	+.6	−2.2
1937	do	100	5	.0	+.03	+1.5	+.2		.0	−.2	−1.4
1937	do	50	10	+.2	+.13	+2.2	+.6				
1937	Litchfield	10	49	+.3	+.12	+.6	+.4	−.04	+1.0	+.3	−1.4
1937	Bard	10	52	+.2	+.14	+3.1	+.9	−.07	+.2	+.3	−1.5
Mean difference				+0.16	+0.10	+1.82	+0.5	−0.08	+0.29	+0.26	−1.92

[1] A plus sign indicates a difference in favor of S × P, a minus sign a difference in favor of Pima.
[2] Lint index is the weight in grams of lint of 100 seeds: seed index the weight in grams of 100 seeds.

Table 3 summarizes the results obtained by the analyses of samples from 30 tests in which S × P and Pima were grown under comparable conditions. The mean lint percentages for S × P and Pima, respectively, are 28.9 and 27.1. When expressed as a percentage of the

Pima outturn, the actual difference of 1.8 percent amounts to a difference of 6.7 percent in favor of S × P over Pima. The means of the lint percentages obtained in the yield tests (table 1) are 29.2 and 27.2 for S × P and Pima, respectively. In this instance the actual difference of 2.0 percent, in favor of the S × P variety, amounts to 7.2 percent of the Pima gin outturn.

TABLE 3.—*Means of S × P, Pima, and the differences (S × P minus Pima) between the two varieties for characters, as determined by analyses of samples obtained from test plots*

Item	Weight of seed cotton per boll	Weight of lint per boll	Lint percentage	Lint index [1]	Lint length	Seeds per boll	Seed index [1]	Seed fuzziness grade	Bolls per pound of seed cotton	Bolls per pound of lint
	Grams	*Grams*			*Inches*	*Number*			*Number*	*Number*
S × P	3.31	0.96	28.92	5.45	1.521	17.67	13.61	5.00	138.7	479.5
Pima	3.15	.86	27.10	4.95	1.605	17.38	13.35	6.92	145.3	536.2
Mean difference (S × P − Pima) [2]	+.16	+.10	+1.82	+.50	−.084	+.29	+.26	−1.92	−6.6	−56.7
Standard error of difference	±.035	±.012	±.182	±.041	±.0062	±.143	±.071	±.131	±1.59	±7.87
Mean difference ÷ standard error	4.6	8.3	10.0	12.2	13.5	2.0	3.7	14.7	4.2	7.2
Difference as a percentage of the Pima mean	*Percent* 5.1	*Percent* 11.6	*Percent* 6.7	*Percent* 10.1	*Percent* 5.2	*Percent* 1.7	*Percent* 1.9	*Percent* 27.7	*Percent* 4.5	*Percent* 10.5

[1] Lint index is the weight in grams of fiber from 100 seeds; seed index is the weight in grams of 100 seeds.
[2] A plus sign indicates a difference in favor of S × P, whereas a minus sign shows a difference in favor of Pima.

Under commercial conditions, S × P has exceeded Pima by a wider margin. Gin records in 1935 for 14 fields of S × P and 9 fields of Pima, all located in the Chandler district, show that S × P gave an average gin outturn 11.1 percent greater than Pima, the actual lint percentages for the two varieties having averaged 27.9 and 25.1, with an actual difference of 2.8 percent. In this comparison, although S × P outyielded Pima by 25 pounds of lint per acre, the yield of seed cotton was approximately the same for both varieties. In another record of commercial production, obtained in the course of a production survey made in cooperation with the University of Arizona, in 1937, 23 fields of S × P averaged 26.4 percent in gin outturn, as compared with 23.5 percent for 41 fields of Pima, with no deduction for trash in either case. The actual difference of 2.9 percent in gin outturn amounts to 12.3 percent more lint for S × P than Pima, from equal quantities of seed cotton. The figures from the survey show that S × P exceeded Pima in seed cotton production by only 5.3 percent but produced 364 pounds of lint per acre as against 307 pounds for Pima, and thus surpassed that variety by 18.5 percent in production of lint.[5]

The greater difference in lint percentage found in commercial plantings, as compared with samples from test plots, raises the question as to which method is the more trustworthy for comparing lint percentages. Although samples from test plots represent the varieties

[5] Comparable records obtained in connection with the cooperative production survey in 1938 show a substantial decline in the yields of both varieties, from the preceding season, and a rise in the gin outturn. In 1938, 39 fields of Pima yielded 282 pounds of lint per acre, as compared with a yield of 277 pounds for 34 fields of S × P. The lint percentage was 25.6 for Pima and 27.5 for S × P. The difference in lint percentage between the two varieties declined from 2.9 in 1937 to 1.9 in 1938.

as grown under strictly comparable conditions, definitely subnormal bolls are not collected, whereas in commercial plantings all open bolls usually are picked. The latter method penalizes whichever variety produces a larger proportion of subnormal bolls.

EARLINESS

The tests of which the results are presented in table 1 were designed primarily to compare yields, but in 17 of the 22 comparisons the quantity of seed cotton obtained in the first picking was recorded as a percentage of the total yield. The differences (S × P minus Pima) averaged 3.65 percent in favor of S × P. Pima yielded a higher proportion of seed cotton in the first picking in only 2 of these 17 comparisons. These results indicate that S × P matures somewhat earlier than Pima or, more probably, that it produces a relatively larger bottom crop. An experiment conducted at Sacaton, in 1931, did not reveal any difference of significance between the two varieties in the number of days from flower to open boll.

VEGETATIVE BRANCHES

The Sakellaridis or Sakel variety, one of the parents of S × P, as grown at Sacaton, has always shown a much greater tendency than Pima, the other parental variety, to develop vegetative branches or limbs from the lower nodes of the main stalk. As an excessive development of such branches early in the season results in partial suppression of the lower fruiting branches and consequently in retarded maturity of the crop, it is of interest to compare the Pima and S × P varieties in regard to this character. Such comparisons, under like conditions of growth, were made in 1931 and in 1937. In both years, the plants of S × P were found to have more than twice as many limbs as Pima plants grown in adjacent rows or in close proximity. However, it has been observed that many of the limbs in S × P develop late in the season and remain small.

BOLLS

The bolls of S × P are only slightly larger than Pima bolls, as measured before opening (fig. 1), but they contain appreciably more cotton. The average weight of seed cotton per boll is 5.1 percent greater in S × P, and that variety exceeds Pima in weight of lint per boll by 11.6 percent. From the data summarized in table 3, it is computed that on the average about 139 bolls of S × P are required to produce 1 pound of seed cotton, as compared with 145 for Pima. The difference in boll content is greater in respect to lint. In Pima, on the average, 536.2 bolls are required in order to obtain 1 pound of lint, as compared with 479.5 in S × P, a difference of 56 bolls.

It is interesting to note that the respective percentages by which bolls of S × P exceed Pima bolls in content of seed cotton and lint approximate the percentages by which S × P outyields Pima in production of seed cotton and lint in test plots (table 1).

Bolls of S × P can be picked more easily than Pima bolls because they open more widely. The difference between the varieties in this respect is particularly noticeable in the later maturing bolls. On the other hand, a general belief that S × P is more wasty than Pima is corroborated by a small test made at Sacaton in 1936, a season when Egyptian cotton was especially prone to waste from the bolls. In the test, it was found that 24 percent of the total weight of seed cotton produced by the S × P plants prior to December 10 had fallen to the ground, as compared with 18 percent for Pima. Unfortunately, the plots were not at all comparable, the Pima having been favored by situation, and the results of the test can be considered only as indicative of a difference between the two varieties in respect to field waste. The figures show clearly, however, that Egyptian-type cottons, under conditions prevailing in Arizona, must be picked promptly in order to prevent waste and loss of quality.[6]

SEED FUZZINESS AND GINNING RATE

According to standards for seed fuzziness set up in connection with the breeding of Egyptian cottons, S × P has an average grade of 5.0, as compared with 6.9 for Pima (fig. 2). In this series, grade 1 represents seeds practically devoid of fuzz and grade 9 the fuzziest seeds encountered among the cottons of Egyptian type cultivated at Sacaton.

The less fuzzy seeds enable S × P to be ginned more rapidly than Pima. Comparative ginning tests conducted at Sacaton in 1934 by J. S. Townsend, of the Bureau of Plant Industry, United States Department of Agriculture, indicated a gin outturn 30 to 50 percent faster for S × P than for Pima. In the same year, at a commercial gin which handled both varieties, it was found that S × P ginned 25 percent faster than Pima. A canvass of gins in the Salt River Valley, in 1937, brought forth estimates of the number of bales of lint obtained, in a given period of time, with the gin equipment available (table 4).

TABLE 4.—*Estimates of the number of bales of lint obtained from S × P and Pima in a given period of time, from a canvass of gins in the Salt River Valley in 1937*

Gin	Bales of lint	
	S × P	Pima
	Number	*Number*
A	11	10
B	20–21	17
C	19	16
D	24	19–20

According to these estimates, on the average about three more bales of S × P than of Pima lint are taken from the gins in a given period of time. Although the less fuzzy seeds of S × P are a large factor in the faster ginning rate of that variety, some of the difference is attributable to the higher lint percentage.

[6] There is some reason to believe that, when left exposed too long before picking, S × P lint discolors more than Pima lint, taking on a grayish or bluish tinge.

LINT CHARACTERS

ABUNDANCE.—The higher lint percentage of S × P is accounted for, not by lighter seeds, but by greater abundance of lint on the seeds (fig. 3). As shown by the means for seed index and lint index[7] as given in table 3, seeds of S × P, on the average, weigh 1.9 percent more than Pima seeds and develop 10.1 percent more lint. The mean

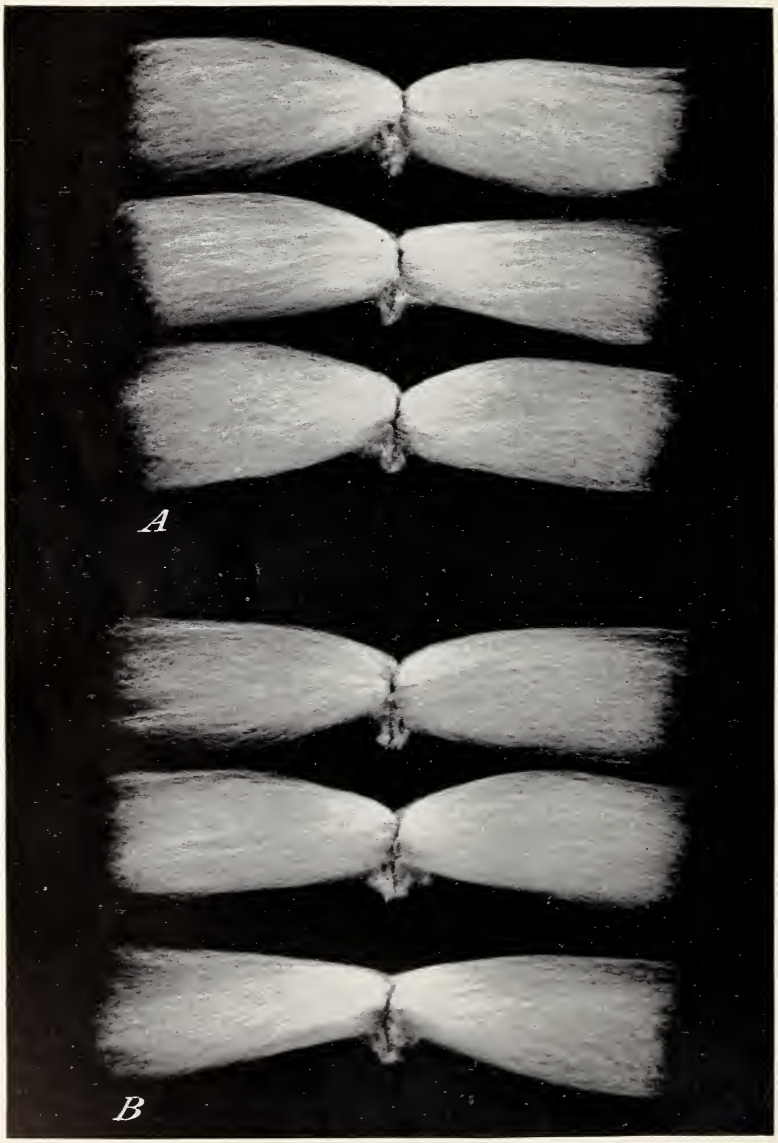

FIGURE 3.—Seeds with combed fibers attached. S × P (*A*) has shorter and more abundant lint than Pima (*B*).

[7] Seed index is the weight in grams of 100 seeds. Lint index is the weight in grams of the fiber from 100 seeds.

lint index of S × P and of Pima is, respectively, 5.45 and 4.95. The difference of 0.50 is highly significant in view of the unbroken array of positive values for the difference in lint index presented in table 2.

Color.—The lint of S × P is lighter colored than that of Pima and resembles Sakel cotton in this respect. On the basis of a series of grades ranging from 1 (the whitest) to 9 (the brownest), representing the range of color ordinarily found in cottons of Egyptian type, the average of comparisons made in 8 successive years is 1.6 for S × P and 4.0 for Pima.

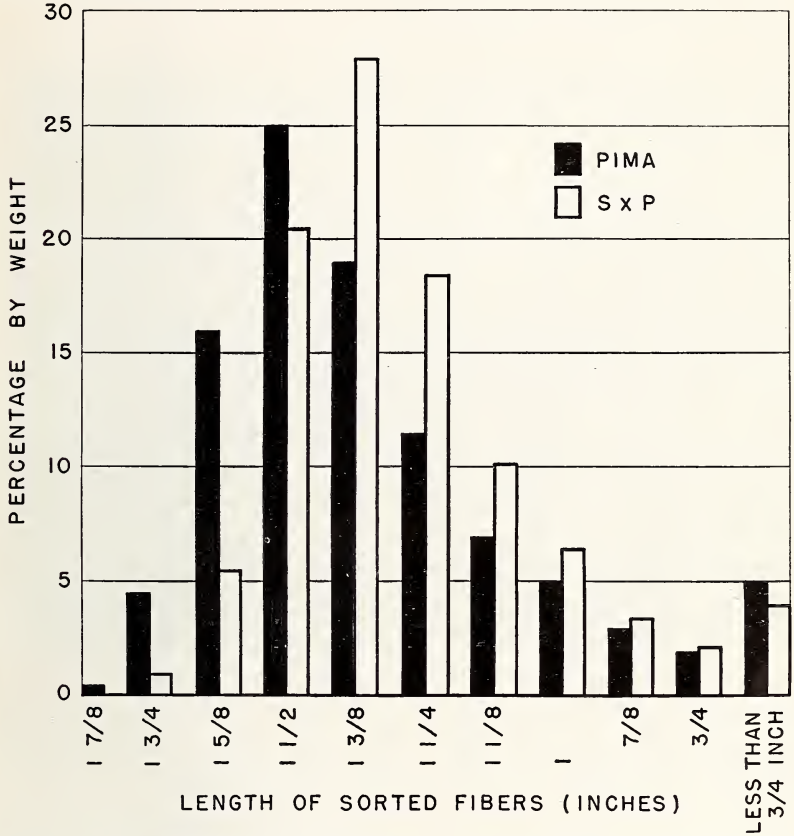

Figure 4.—Distribution of sorted fibers of S × P and Pima. Data for plotting the bars were obtained from comparative sortings made at Sacaton, Ariz., in 1934, 1935, and 1936.

Length.—The lint of S × P is consistently shorter than that of Pima (fig. 3). According to the means given in table 3, the average staple length of S × P is about 1.5 inches, as compared with an average of about 1.6 for Pima. The difference is equivalent to nearly three thirty-seconds of an inch. Samples of the lint of the two varieties, produced in 1932 and 1933, were classed as to length by the Appeal Board of Review Examiners of the Bureau of Agricultural Economics as follows: S × P, 1 1/16 inches; Pima, 1 1/8 inches.

Uniformity of length.—Fibers of S × P are more uniform in length than Pima fibers, according to determinations made on a sorting device by means of which fibers can be separated into successive classes

differing in length by one-eighth of an inch. The combined data from comparative sortings made at Sacaton in 1934, 1935, and 1936 are plotted in the form of bars in figure 4. The greater uniformity and shorter modal length of the fibers of S × P are apparent. As shown in table 5, the percentage of fibers occurring in the modal length group (the 3 largest ⅛-inch length classes combined) is greater in S × P than in Pima in all comparisons, although the difference in the last comparison is negligible. Figure 5 illustrates the distributions of the fibers in representative samples of these varieties, as taken from the sorter in successive length classes.

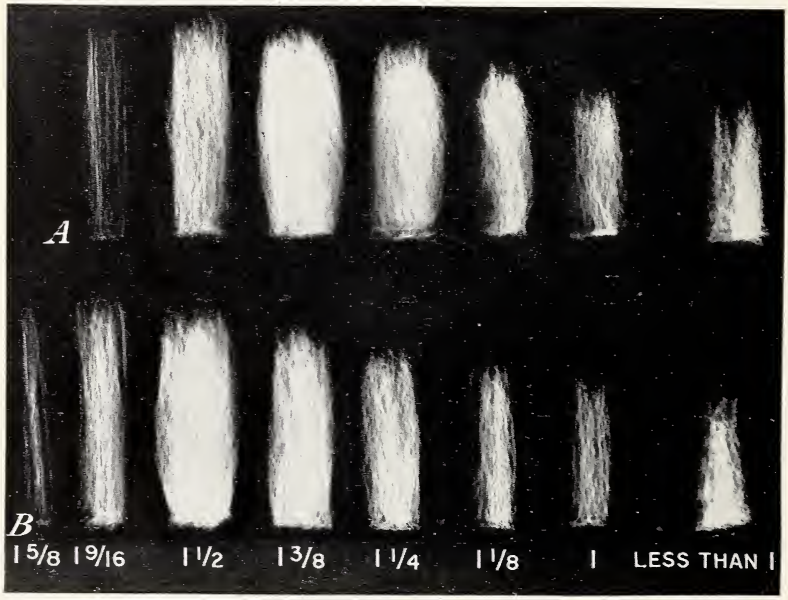

FIGURE 5.—Sorted fibers of S × P (*A*) and Pima (*B*).

TABLE 5.—*Percentage of fibers in the modal length group, which is a combination of the 3 length classes containing the largest proportion of the total weight of sorted fibers*

Year	Fibers in modal length group		
	S × P	Pima	Difference
	Percent	*Percent*	*Percent*
1934	62.8	55.8	7.0
1935	59.2	51.6	7.6
1936	70.0	62.7	7.3
1937	64.3	63.9	.4

FINENESS.—No appreciable difference in the fineness of the two varieties has been brought to light by the meager experimental evidence available at this time. Opinions of classers and spinners are contradictory in respect to the comparative fineness of the lint of S × P and Pima.

RESULTS OF SPINNING TESTS

The results of comparative spinning tests on the crops of 1927, 1932, and 1933, two of which were conducted by the Bureau of Agricultural Economics and two by manufacturers, are summarized in table 6. Single yarns made of S × P had a slightly greater breaking strength than comparable Pima yarns, with but one exception, and this notwithstanding the fact that S × P has shorter lint than Pima.[8]

TABLE 6.—*Comparative breaking strength of yarns made from S × P and Pima cottons, as determined by the U. S. Department of Agriculture on the crops of 1927 (test 1) and 1933 (test 2) and by manufacturers on the crop of 1932 (tests 3 and 4)*

Test No.	Yarn count	Breaking strength (pounds per skein)		Breaking strength of S × P as a percentage of Pima breaking strength
		S × P	Pima	
		Pounds	*Pounds*	
1	100s	22.5	21.7	103.7
	120s	15.8	15.4	102.6
2	80s	30.2	29.0	104.1
	100s	21.3	20.8	102.4
	120s	15.5	14.7	105.4
3	70s	39.4	[1] 39.4	100.0
4	100s	22.0	21.2	103.7

[1] Average of 2 lots.

Laboratory spinning tests have also been made on more recent crops to compare the manufacturing quality of Pima and S × P cotton.[9] Test No. 1 included one sample of each cotton grown at Sacaton, Ariz., in 1934. Two pairs of samples grown in 1935 were used in test No. 2 and included the first picking of each variety grown at Sacaton and the second picking of each produced at Glendale, Ariz. The samples used in these tests were obtained by the Bureau of Plant Industry and are believed to be fairly representative of the two varieties.

The spinning-test procedure used will not be described; it is sufficient to say here that the usual procedure for long-staple cottons employed at the spinning laboratory was followed.

The data in table 7 show that in test No. 1 the S × P cotton was a trifle more wasty than the Pima in respect to the total quantity of waste removed during processing. This was due to a higher percentage of comber waste for the S × P. The percentage picker and card waste was slightly lower for this cotton. The grade of the S × P was one-half a step lower than that of the Pima in this test.

The strengths of nine different numbers of yarn, ranging from 10's to 120's, spun from each of the cottons in test No. 1 are shown in table 8. Although the S × P was classed as three-sixteenths of an inch shorter in staple than the Pima, the S × P yarns were stronger in every case, the difference averaging 3.2 percent.

Some difficulty was experienced with roller laps at the roving frames when each of the cottons of test No. 1 was processed. Records kept of these roller laps showed the Pima to be slightly worse than the

[8] It has been reported that S × P, in comparison with Pima, shows a greater superiority of strength in ply yarns than in single yarns: also, that S × P shows definite superiority to Pima in the strength of yarns made from low-grade cotton. Experimental evidence to substantiate these reports is not yet available.

[9] These tests were conducted by the Agricultural Marketing Service at Clemson, S. C., in cooperation with the Clemson Agricultural College, under the supervision of M. E. Campbell, and were part of the program of work being conducted under the general direction of R. W. Webb, Agricultural Marketing Service.

S × P in this respect. The Pima roving was found to contain more bunches or thick places than the S × P roving. As might be expected to follow from this, the S × P yarns were somewhat smoother and more uniform than those spun from the Pima in this test.

Manufacturing waste percentages for test No. 2 are shown in table 7. The classers found the first picking of S × P to be lower in grade, but in spite of this it was significantly less wasty than the Pima. The cottons were of low grade at the second picking, both being classed as grade 3½. The S × P yielded significantly less waste.

The cottons used for test No. 2 were both longer than the corresponding varieties in test No. 1 in the case of the first picking. The Pima was found to be 1⅝ inches in staple, 1/16 inch longer than the S × P. From the second picking, both were classed as 1½ inches. As in test No. 1, the results presented in table 8 show that the S × P yarns were consistently stronger than the Pima yarns, the difference averaging 5.3 percent for the first picking and 5.3 percent for the second.

TABLE 7.—*Percentages of manufacturing waste removed in processing Pima and S × P cotton*

TEST NO. 1

Kind of cotton and place where grown	Grade	Waste		
		Picker and card [1]	Comber [2]	Total [1]
		Percent	*Percent*	*Percent*
Pima	1	9. 15	13. 16	21. 20
S × P	1½	8. 89	16. 48	23. 93
TEST NO. 2				
Sacaton, Ariz.: [3]				
Pima	1	8. 25	15. 24	22. 09
S × P	1½	7. 11	14. 18	19. 99
Glendale, Ariz.: [4]				
Pima	3½	9. 96	19. 34	27. 92
S × P	3½	8. 51	18. 02	24. 68

[1] Based on weight fed to opener.
[2] Based on weight fed to comber.
[3] First picking.
[4] Second picking.

TABLE 8.—*Average skein strength of combed warp yarn spun from Pima and S × P cotton*

TEST NO. 1

Kind of cotton and place where grown	Staple length	Test strength of yarn No.—								
		10s	15s	22s	28s	50s	60s	80s	100s	120s
	Inches	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Pima	1 9/16	369. 9	232. 4	163. 5	120. 8	58. 0	46. 0	30. 5	22. 4	16. 0
S × P	1⅜	380. 0	240. 2	166. 0	122. 9	61. 1	47. 8	32. 1	23. 0	16. 6
TEST NO. 2										
Sacaton, Ariz.: [1]										
Pima	1⅝							31. 7	23. 7	18. 1
S × P	1 9/16							33. 5	24. 7	19. 2
Glendale, Ariz.: [2]										
Pima	1½							32. 0	23. 0	17. 2
S × P	1½							33. 0	24. 1	18. 6

[1] First picking.
[2] Second picking.

Roller lapping was again noticeable in the card room, with the Pima possessing this fault to a slightly greater degree.

Although the yarns from both varieties contained some neps, a careful classing of yarn-inspection boards showed a consistent advantage in favor of the S × P.

To summarize these laboratory spinning tests on samples of the crops of 1934 and 1935, it may be said that the findings with regard to manufacturing waste were somewhat inconsistent, although there were indications that the Pima tended to yield more waste; that the S × P yarns averaged from 3.2 to 5.3 percent higher in strength than the Pima yarns, even though the S × P was considerably shorter in staple except for the second picking, test No. 2; that both cottons showed a tendency toward roller lapping, with the Pima being slightly the greater offender; and that the S × P yarns were smoother and of better appearance than the Pima yarns in practically every case.

SUMMARY

In respect to yield, S × P cotton is shown by comparative tests to be superior to Pima. The new variety possesses an advantage over Pima amounting, on the average, to approximately 5 percent in yield of seed cotton and about 13 percent in production of lint.

The favorable differential in gin outturn, or lint percentage, is a decided advantage of the S × P variety, for the extra lint gained in this way adds nothing to the cost of production. The higher lint percentage is accounted for by greater abundance of lint on S × P seeds, not by smaller or lighter seeds.

The results of a small number of comparisons indicate that a larger proportion of the total crop usually is included in the first picking of S × P, as compared with Pima. This substantiates a belief held by growers that S × P is the earlier variety.

Bolls of S × P appear to be more wasty than Pima, a characteristic that is disadvantageous at times when pickers are scarce. On the other hand, S × P bolls contain appreciably larger quantities of cotton and are more easily picked.

S × P seed cotton can be ginned approximately 20 percent faster than Pima.

The lint of S × P is shorter but more uniform in length and is lighter colored than that of Pima.

The results of six comparative spinning tests of S × P and Pima cottons showed that the yarns made from S × P had a greater breaking strength, for all counts from 10 to 120, than the corresponding yarns made from Pima, with a single exception, in which there was no difference between the varieties. In all other instances the S × P yarns were from 2.4 to 5.4 percent stronger than the Pima yarns, notwithstanding the greater staple length of the latter cotton. In nearly every sample the S × P yarns were smoother and of better appearance than the Pima yarns.

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